LISTINGS NEWSLETTER

Newsletter of the
Long Island Sinclair/Timex
Users Group

Incorporating NYTSE

Issue APRIL 1991

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LONG ISLAND SINCLAIR TIMEX

USERS GROUP PRESENTS

ZX-81 AND TS1000

TECHNICAL TIDBITS

PART II

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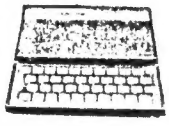


Software Review

Hardware Review

THIS IS THE LAST ISSUE OF LISTING TO BE PUBLISHED. DETAILS ON PAGE 4.

IN 1989 L.I.S.T. PRESENTED ZX-81 AND TS1000 TECHNICAL TIDBITS.

A CUMULATION OF SOME OF THE BEST TECHNICAL ARTICLES WRITTEN ABOUT THESE MACHINES.

MANY SINCLAIR/TIMEX USERS HAVE SENT TO L.I.S.T. QUESTIONS WHICH WERE UNANSWERED IN TECHNICAL TIDBITS.

PART II IS NOW PRESENTED TO ANSWER THESE QUESTIONS.

PART II IS ALSO A CUMULATION OF TECHNICAL ARTICLES WHICH EXPLAIN HOW AND WHY THINGS ARE DONE WITH THE ZX-81 AND TS1000 COMPUTERS.

THE PAGES OF PART II HAVE BEEN NUMBERED SEQUENTIALLY TO BE COMBINED BEHIND PART I.

WE HOPE YOU ENJOY THESE ARTICLES AND THEY HELP ANSWER QUESTIONS YOU MAY HAVE ABOUT THESE GREAT COMPUTERS.

LIST OFFICERS

PRES. HARVEY RAIT
TRES. ROBERT MALLOY
COR.SEC. JOHN FAZIANO
EDITOR. FRED STERN
LIBR. TOM SKAPINSKI

PLEASE SEND INQUIRIES TO:
LIST
MR. HARVEY RAIT
5 PERI LANE
VALLEY STREAM, N.Y. 11581

PLEASE SEND SUBMISSIONS TO:
LISTING
MR. FREDERICK STERN
214 ROBERTS ST.
HOLBROOK, N.Y. 11741

NYTSE

NYTSE MEETS THE MONDAY AFTER THE LIST MEETING AT:
MISS KIMS RESTAURANT
PARK AVENUE SOUTH
BETWEEN 21 ST. AND 22 ST.
MEETINGS START 7:30 PM.

COMING EVENTS

MAY. 6, 1991 LIST MEETING
MAY. 8, 1991 NYTSE MEETING
JUNE 9, 1991 LIST SWAPMEET

MEETING MINUTES

APR. 14, 1991

HARVEY CALLED THE MEETING TO ORDER AT 2:00PM.

HARVEY ANNOUNCED THAT THE CLUB HAS PURCHASED A QL COMPUTER WITH ACCESSORIES AND SOFTWARE. THIS AND OTHER TIMEX EQUIPMENT WILL BE AUCTIONED AT THE JUNE SWAPMEET.

BOB MALLOY REPORTED THAT THE CLUB FINANCES ARE IN GOOD SHAPE.

ZX81 AND TS1000 TECHNICAL TIDBITS PART II IS FOR SALE THROUGH LIST, $4.00 AT MEETINGS, $5.00 BY MAIL.

HARVEY WILL WRITE A LETTER TO BILL FREEBEE AT COMPUTER MONTHLY TO TELL HIM ABOUT LIST, AND WHAT WE ARE OFFERING TO THE TIMEX COMMUNITY.

IN JUNE WE WILL HAVE A MEETING/SWAPMEET. ALL SELLERS ARE REQUESTED TO SEND A LIST OF ITEMS WITH PRICES FOR PUBLICATION IN LISTING. PLEASE SEND IN YOUR LIST BY THE APRIL MEETING.

TECHNICAL NEWS

THE FOLLOWING PROJECTS ARE BEING WORKED ON BY LIST MEMBERS:
1. SAVINGS AND LOAD OF THE TIMEX COMPUTER.
2. UPDATED TS1000 WITH 16K+ RAM AND IMPROVED VIDEO.

PROGRAM TAPES

THE LIST TS1000 AND TS2068 PROGRAM TAPES ARE READY FOR SALE.

THE PRICES ARE:
$6.00 BY MAIL
$4.00 AT THE MEETINGS

LECTURE + DEMONSTRATION

BOB GILDER GAVE A VERY INTERESTING LECTURE AND DEMONSTRATION ON PRINTER INTERFACING, AND PROGRAMING. HE EXPLAINED HOW THE COMPUTER PROGRAM AT THE MACHINE CODE LEVEL ADDRESSESTHE PRINTER TO PRINT A LETTER OR STRING OF LETTERS.
WE ALSO LEARNED THE DIFFERENCES IN OPERATION OF VARIOUS MAKES OF PRINTERS THAT ARE AVAILABLE ON THE MARKET. BOB DEMONSTRATED SOME PRINTER TECHNIQUES ON THE QL.
THE DEMONSTRATION ENDED WITH A QUESTION AND ANSWER SESSION.

CLASSIFIEDS

THIS CLASSIFIED SECTION IS AVAILABLE TO ALL LIST MEMBERS FREE OF CHARGE.
THE ONLY RESTRICTION IS THAT IT IS TO BE USED ONLY FOR THE SEEKING, SELLING OR SWAPPING OF SINCLAIR, TIMEX OR MICROACE COMPUTER EQUIPMENT, PERIPHERALS AND SOFTWARE.
LISTING, LIST, AND ITS OFFICERS DO NOT ENDORSE, WARRANTY, OR GUARANTEE ANY OF THE ITEMS LISTED IN THIS CLASSIFIED SECTION

SEE PAUL DONNELLY'S AD IN THIS EDITION OF LISTING. LOTS OF GREAT EQUIPMENT FOR SALE.

I AM LOOKING FOR A DISK DRIVE CASE, FOR ONE OR TWO FULL HEIGHT DRIVES, WITH POWER SUPPLY. FRED STERN 516-737-0983.

IRISH PCC-10 BLANK TAPES AT AN INCREDIBLY LOW PRICE. CALL TOM 516-732-1825.

A FINAL WORD

MY NAME IS FRED STERN AND I AM THE EDITOR OF THIS EDITION OF LISTING.

LISTING NEED A NEW EDITOR NOW. IF YOU FEEL YOU ARE MATURE ENOUGH TO TAKE ON THE RESPONSABILITY TO BE THE NEW EDITOR OF THIS NEWSLETTER, CALL ME AT 516-737-0983.

THANKS TO BOB GILDER, TOM SKAPINSKI, AND ALL THOSE WHO HELPED MAKE THIS EDITION OF LISTING POSSIBLE.

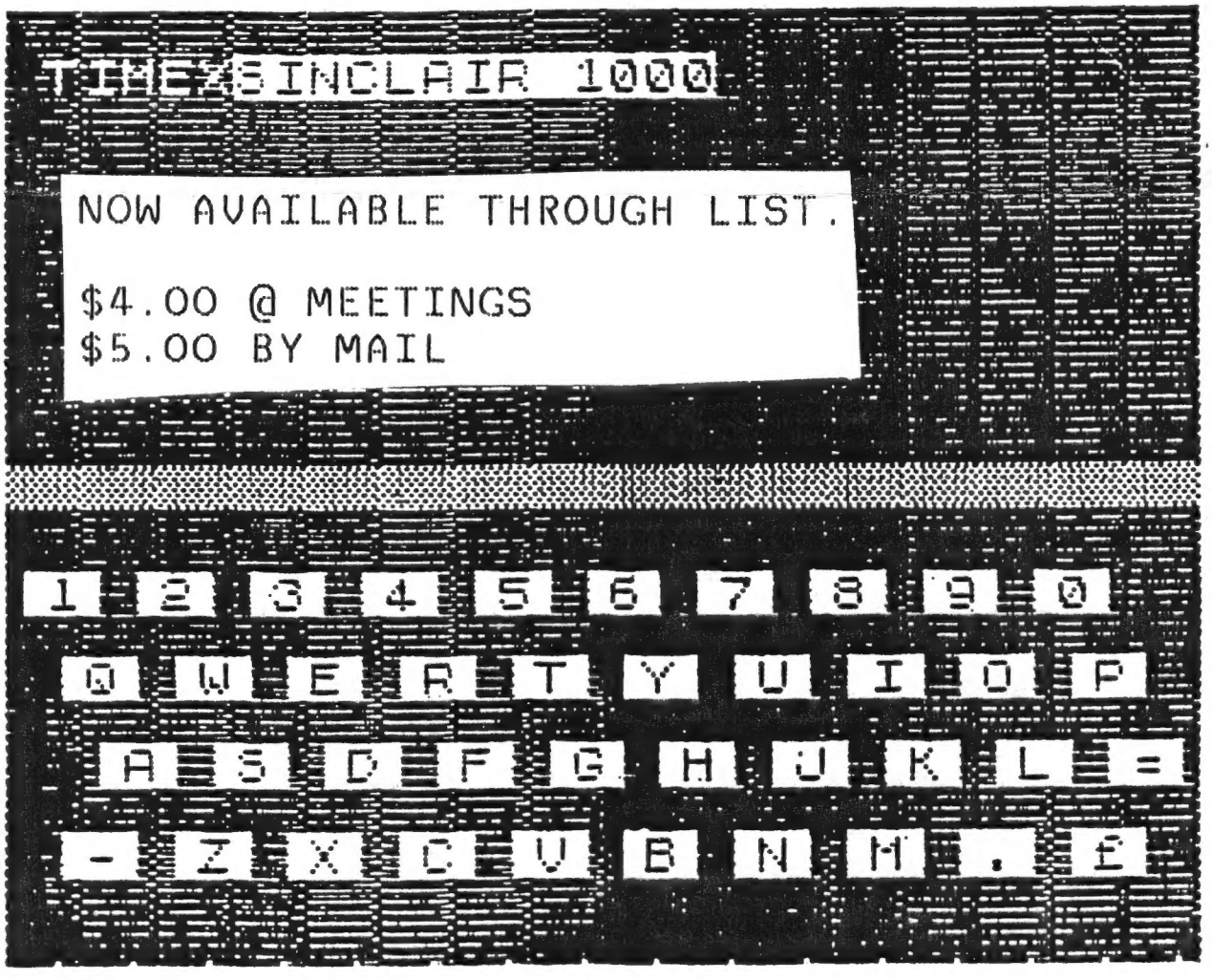
SEE YOU ALL AT THE NEXT MEETING.

LONG ISLAND SINCLAIR TIMEX USERS GROUP PRESENTS

ZX-81 AND TS1000

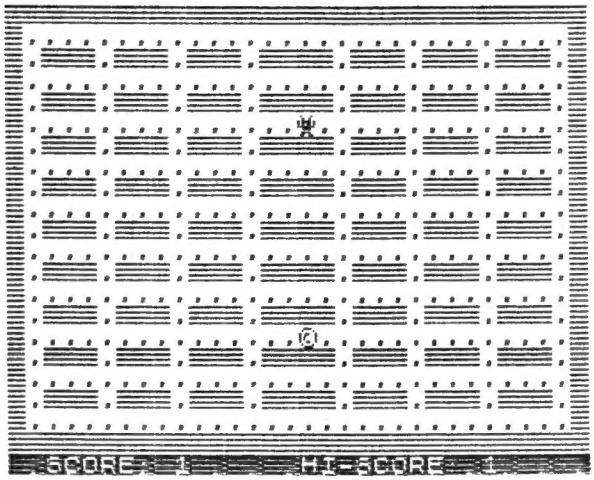
TECHNICAL TIDBITS

PART II



*** ZOMBIE *** BY KEITH SKAPINSKI

```
  1 GO SUB 410
 10 REM ***   ZOMBIE   ***
 20 REM BY KEITH SKAPINSKI
 30 REM
 40 FOR i=USR "a" TO USR "b"+7
 50 READ a: POKE i,a: NEXT i
 60 DATA 255,0,255,0,255,0,255,
0,66,36,189,173,255,36,36,102
 70 LET h=0
 80 LET s=1
 90 CLS : PRINT "Difficulty Lev
el? (1-3)""""1=Easy 3=Hard"
100 LET q$=INKEY$: IF q$<"1" OR
 q$>"3" THEN GO TO 100
110 LET l=(VAL q$+2)/5: CLS
120 LET x=15: LET y=16: LET a=5
: LET b=16
130 CLS
140 PRINT "AAAAAAAAAAAAAAAAAAA
AAAAAAAAAA"
150 FOR i=1 TO 19: PRINT AT i,0
;"A.........................
.A": NEXT i
160 PRINT "AAAAAAAAAAAAAAAAAAA
AAAAAAAAAA"
170 FOR i=2 TO 18 STEP 2: PRINT
 AT i,2;"AAA.AAA.AAA.AAAA.AAA.AA
A.AAA": NEXT i
180 PRINT AT x,y;"©": PRINT AT
a,b; OVER 1;"B"
190 IF a=x AND b=y THEN GO TO 3
30
200 IF s/372=INT (s/372) THEN B
EEP 1,1: LET s=s+1: GO TO 120
210 LET x1=x: LET y1=y: LET a1=
a: LET b1=b
220 LET x=x+(INKEY$="6" OR IN 3
1=4)-(INKEY$="7" OR IN 31=8)
230 LET y=y+(INKEY$="8" OR IN 3
1=1)-(INKEY$="5" OR IN 31=2)
240 IF CODE SCREEN$ (x,y)=0 THE
N LET x=x1: LET y=y1: BEEP .01,1
0
250 IF SCREEN$ (x,y)="." THEN L
ET s=s+1: BEEP .0001,60
260 IF RND<l THEN LET a=a+(x>a)
-(x<a): IF CODE SCREEN$ (a,b)=0
THEN LET a=a1
270 IF RND<l THEN LET b=b+(y>b)
-(y<b): IF CODE SCREEN$ (a,b)=0
THEN LET b=b1
280 IF s>h THEN LET h=s
290 PRINT AT 21,0; INK 2; INVER
SE 1;"  SCORE: ";s,"HI-SCORE: ";
h,
300 PRINT AT a1,b1; OVER 1;"B"
310 PRINT AT x1,y1;" "
320 GO TO 180
330 PRINT AT 10,10; FLASH 1;" G
AME  OVER "
340 BEEP 1,0: BEEP 1,0: BEEP .1
,0: BEEP 1,0: BEEP 1,3: BEEP .5,
2: BEEP 1,0: BEEP .5,-1: BEEP 1,
0
350 DIM a$(704): FOR i=0 TO 7:
BEEP .001,i+40: PRINT AT 0,0; IN
K i; OVER 1;a$: NEXT i
360 CLS
370 PRINT AT 10,1; FLASH 1;" PR
ESS ANY KEY FOR ANOTHER GO "
380 IF INKEY$="" THEN OUT 254,R
ND*255: GO TO 380
390 BORDER 7: GO TO 80
400 STOP
410 CLS : PRINT AT 10,5;"KEMPST
EN COMPATABLE": PAUSE 150
420 RETURN
430 CLEAR : RANDOMIZE USR 100:
OPEN #4,"dd": PRINT #4: SAVE "ZO
MBIE.BA"
```



THIS IS THE LAST ISSUE OF LISTING TO BE PUBLISHED.

This headline could appear in the Summer issue.
I am resigning as editor of LISTING.
The Summer issue will be my last.
If a volunteer does not come forward to take over for me by the June Meeting, this headline will arrear.
Its up to you,
VOLUNTEER NOW!!!.

Fred Stern
Testing
Editor

L.I.S.T.

Paul Donnelly 261-6934

TS1000 Items

All prices are "pick up" only

TS1000.. Complete in original carton w/all original cables, etc.
2 available
$10.00

TS1016.. 16K Rampack Original $ 5.00

Memotech Add-on 16K rampack(can be used as 16k pack or as a second 16K, bringing your system to 32K). Has thru connector.
$ 7.00

Cassettes, Various titles, no selection $ 0.10

Byte Back BB-1 interface, 8 Real relays for control of external devices(security system, home control, science projects), and 8 TTL(not wimpy CMOS) inputs for monitoring signals to your computer. Some applications software provided. I/O connector is 44 pin .156"(one supplied), available at Radio Shack, etc. Has timex thru connector.

$10.00

TS1510 Cartridge Player w/ States and Capitals Cartridge

$25.00

Defective TS1000 motherboards and rampacks:
$ 1.00/or less

TS2068

Complete in factory carton, with all original equipment, and INSTALLED Romswitch for complete Spectrum compatibility.
$50.00

TS2068/ Spectrum Cassettes/software $ 1.00

General

Books on Timex computers, various titles
$ 1.00

Used data cassettes
$ .05

Centronics 101 printer. Complete with centronics interface connector, and standard parralell printer connection(yes this printer just plugs right in to a PC or clone). Needs parallel IF if used w Timex computers, Test board, starter paper supply, and new spare ribbon included. You must come and pick up this unit as it weighs over 100 lbs., and is built like a rock. Wide carriage, upper case only(lower case and graphics boards can be purchased elsewhere).

Special $ 5.00

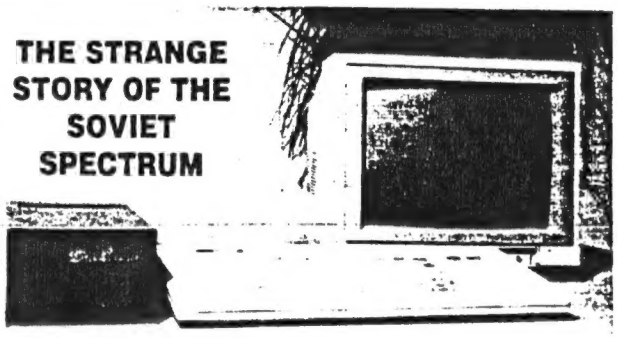
.

HARDWARE

RAGE HARD!

The Hobbit is a Soviet Spectrum clone that does everything Uncle Clive built into the original Speccy, plus a lot of the things he forgot – and it'd only cost you 13 years' salary to buy one! Join big KEITH POMFRET for...

THE STRANGE STORY OF THE SOVIET SPECTRUM



Lumme, call this a Spectrum? It's too sleak and slinky by far!

The other week we had a phone call – there were a couple of Leningrad computer designers in London showing off their brand-new Spectrum-compatible machine, and did we want to see it? Well, of course we blooming well did! Come down to Bath, we said, and let us take it through its paces. The very next day Michail Osetinskij and Dmitri Michailov climbed on the back of Perestroika (well, a British Rail London-to-Bristol loco actually) so we could bring you a report on this powerful new machine.

From Leningrad with love

In the Soviet Union there are no copyright or royalty laws so if you want something you just make or copy it. When Michail and Dmitri needed to produce a computer for the Soviet educational market they chose the Spectrum, but instead of simply cloning it they added a list of features that could show up some western PCs.

Dmitri explained – "In Leningrad, many people get out their soldering irons and make their own computers. It's the only way. The Spectrum is the most well-documented computer in the Soviet Union, so that is where most people start – there are now at least 20 different Spectrum clones in Leningrad alone, so when we wanted to build an educational computer it was the obvious place to start.

"A western PC costs 60,000 roubles to buy in the Soviet Union, you see, and even a Spectrum costs 40,000! At 250 roubles a month, that's just too much."

As to why the Spectrum is so well-known in the Soviet Union, well, just think of the size of it (especially one of our rubber-keyed chums). What would you want to smuggle through customs – a C64 or something you could hide in the lining of your jacket? (It's quite obvious really.)

School Prize

Over 15,000 Hobbits have been produced so far and they are used exclusively in schools. The basic machine comes with two 5.25 inch disk drives, networking and more ports than the south coast.

Games players will be chuffed to know that there are three joystick ports on the back. One is Kempston-compatible and the other two are Sinclair. A built-in ROM routine allows the transfer of tape programs to disk, and any TV or standard PC monitor can be plugged straight in. The memory is 64K (though you can switch to 48 mode if you want).

So what's it like to use?

Well, we powered it up in the *YS* office to take a look. Right, switch it on and... a-ha! There's the familiar Spectrum screen... but (of course) it's in Russian! A single key-press and you can put it back to Uncle Clive's more familiar English message. In fact, to make it easy for any country to use, the single key-press can take the Hobbit from the Russian Cyrillic script to the Western Roman alphabet or anything else you fancy (once you've loaded it in). Another key-press and we could be in Arabic!

The full-sized 74-key keyboard is as comfortable to type on as any conventional PC (and far better than the crappy little things that most Speccies are lumbered with) though the dual Roman/Cyrillic markings on the keys were quite confusing to use. Still, that's only a problem if you're a crappy typist like most of us lot – a touch typist wouldn't look at the keys anyway!

As for what the computer looks like, well, you can see for yourself from the photo. It's sort of off-white, a bit plasticy and rather basic-looking, but it still manages to look a lot more sophisticated than most Speccies! In fact, it's all a bit reminiscent of a Lada really – an old (but perfectly good in its time) western design, spiced up and improved a bit in the Soviet Union. Of course, with Ladas they then brought the thing full circle and sold it back to us! Could the same thing happen with the Hobbit? (Read on!)

But how compatible is it with Spectrum programs?

Well, the Hobbit claims full compatibility with all Speccy stuff, legally programmed or otherwise (though of course in the amount of time we had to spend with it we couldn't really judge how true this is). There's no real reason to doubt it though – a quick look at the workings inside show that there's a good deal of Uncle Clive's original bits and pieces in there!

The Hobbit comes with a built-in diagnostic program monitor and assembler/disassembler that will make life simple for those who like to interfere with their programs. Spectrum Basic is supported (of course) and there's a Soviet version of CP/M (called Beta) included too, which should open up a whole world of business software to the Hobbit. The educational theme is continued with the inclusion of the graphic and list-processing language, LOGO, and provision for including Pascal, C, and Forth on plug in ROMs.

In Leningrad, where the Hobbit is used in many of the schools, the networking abilities mean that students can do their work and hand it in to the teacher's 'master' Hobbit or PC via the network.

The teacher can also monitor what is going on on any other machine, and in the event of one crashing any other Hobbit on the net can be used to 'revive it' and recover files from it. It's a feature that is especially useful in program development because it allows a teacher to examine the crashed machine to see the state of the various registers.

How about games and magazines though? If the thing's mainly used in schools, is there any interest in that sort of thing?

The ability to write and develop software is important behind the Iron Curtain. With few western games, peripherals, or magazines getting through, home grown software is valuable currency.

The quality and quantity of computer publications in the USSR is next to zero. Michail said, "The one computer magazine published in the USSR is dry and corporate. We would like a magazine like *Your Sinclair* that has more life in it."

But is this all really just of curiosity value, or will we ever see the Hobbit actually sold in this country? Well, maybe. Michail confirmed that though they do actually hope to launch the Hobbit in Europe and the Third World, another important reason for coming to the UK was to visit *YS* and show us what's capable behind the (slightly parted) iron curtain! (Sweet of him, eh?)

TECH SPEC

The Hobbit
- Keyboard and processor in a single unit
- Twin 5.25 floppies
- Power supply unit
- Built-in TV monitor colour card

Processor
- Z80A running at 3.5MHz
- 64K of addressed memory
- Operating system ROM (16 8.0K RAM used depending on configuration)
- 64K RAM (48, 54, or 64K including 6.5K screen memory)

Interfaces
- System bus (accessible)
- Parallel port (Centronix)
- RS232 serial port
- Three joystick ports (two Sinclair, one Kempston)

Keyboard
- 74 keys including 33 reprogrammable (soft) keys
- Support of Cyrillic Roman Arabic alphabets

Disk controller
- All types of SS DD and DS DD drives (maximum of four on each machine). Hard disk supported by patching disk-operating system.

Power supply unit
- Independent 5v at 1.5A on 220-240v 50 60 Hz mains power (consumption 7.5 watts)

Video adapter card
- 256×192 dots
- 24×32 characters in text mode
- 15 colours
- 80 columns by 24 lines emulating CP/M
- Supports colour mono TV
- TTL PC monitor

Peripherals
- Up to four disk drives, including two supplied with each Hobbit
- Cassette recorder
- Printer (serial or parallel)
- Joystick
- Lightpen
- Mouse

Software
- Inbuilt BASIC LOGO
- Network drivers (100K Baud)
- BETA (CP/M clone)
- Sockets for ROM operating systems (Pascal, Forth, C)
- Fully Spectrum software compatible

FAX BOX

Anyone wanting to contact Intercompex, the company who manufacture The Hobbit, should write to Intercompex, ul. Kalinina 13, 198099 Leningrad, USSR.

ZX81 ZX81 ZX81

Hardware

The ZX/TS True 64K Internal NVM Upgrade

by V. Lee

Ever since I first heard of the Hunter Board, I wanted to expand the memory on my ZX81 and on my TS1000. The Hunter Board allowed 8K of Battery Back Up RAM to store utilities like SDS or Mini-Xmod in the ZX/TS 8-16K region. The programs would remain in the Non-Volatile Memory even after the computer was turned off, eliminating the chore of reloading the same programs. And being RAM, the old programs were easily changed by placing a new program into the same area.

I began experimenting with 8K Static Ram Chips until I saw an article written by Tim Stoddard. He showed an ingenious method of decoding two 32K SRAM chips to add the full 64K of memory internally. Say goodbye to the old Rampack wobble.

If a couple of batteries were also added to his circuit, we could have a 64K version of the Hunter Board. Almost all programs will run in the normal 16-32K work space, leaving the memory outside of this area available for storing a variety of different programs. This outside area is not affected by "NEW" as long as RAMTOP is not raised.

The 8-16K area is still used for running SDS or WRX16 HIRES software, but the 32-48K area is now used for running resident programs like Memotext, Hi-Z, ZXTerm-80 and others which have been designed to be relocated. The area above 48K is used as a Ramdisk since machine code will not run in this area.

There are various machine code routines which will allow a program from the work area to be saved to RAM. This use of RAM as a "diskdrive" is known as a Ramdisk. I've made some attempts on a Ramdisk program in the April and September 87 issues of ZX-Appeal. But the best example is an Operating System written for the "Delta Device", a 32K NVM system. This program provides hotkey function, internal and transient commands as well as a directory of the stored "files".

I didn't feel there was enough room available for relocated programs. Hi-Z alone occupies the entire 32-48K block. There were two options, buy another 32K SRAM chip for Bank Switching or come up with a gimmick to increase the memory. I decided to choose the route which costs the least amount of money.

There just happens to be 8K of available RAM that is hidden because of the ROM. I decided to connect this block to the second 8K block of RAM and then move them to a new location by reconfiguring the decoding. This new 16K block which I call the "Auxiliary Memory" can be switched in when needed to the 32-48K region. It's great for hiding programs like Hi-Z or for raising Ramtop up to 48K without disturbing the main memory.

The old 40-48K block is made to travel incognito to fill the void. It can be accessed as the 40-48K block or as the 8-16K block, making this area extremely flexible. Data placed by one Address can be read or written over by the other. There is a 32768 Byte difference between the two Addresses.

Remember not to place HIRES software in the old 40-48K block as it will try to overwrite itself. This does not affect HIRES software placed in the Auxiliary Memory.

P A R T S L I S T

U1	74LS10N, 3-INPUT NAND GATE
U2	74LS08N, 2-INPUT AND GATE
U3	74LS145N, BCD TO DEC. DRIVER
U4,5	HM62256LP-15, 32KX8 LOW PWR SRAM
D1,2	1N34A, GERMANIUM DIODE
C1	0.1uF, 100V MONO CERAMIC CAP.
C2	2.2uF or 3.3uF, 16V TANTALUM CAP.
R1,2,3	4.7K, 1/4W RESISTOR
R4	10K, 1/4W RESISTOR
PB1	PUSHBUTTON SWITCH N/O
SW1	TOGGLE SWITCH DPDT
SW2	TOGGLE SWITCH SPST
BATT	3v, 2X1.5V AAA ALKALINE BATTERY WITH HOLDER

ZX81 ZX81 ZX81

Hardware

Assembling the 64K NUM

If you are thinking about building this circuit, you should first examine your ZX/TS system to see if it is compatible. Hardware like Disk Drives and Byte-Back Modems require certain blocks of memory to be disabled. This upgrade fills the entire memory map and would require alterations in the decoding.

You might also prefer making a circuit board to construct this project. Almost all of the signals are available from the card edge connector at the back of the computer. This circuit was assembled with point-to-point wiring. It allowed quick alterations and allowed the circuit to fit inside the computer. 28 gauge ribbon cable was used for the switch and for the power connections while 30 gauge wire wrap wire was used for the rest. The assembling directions in the following paragraphs are on the point-to-point method.

Between these two extremes is a third method of modifing an existing memory board to fit the circuit. There are various electronic outlets and computer swap meets which sell used computer boards for well under five dollars. Some of these boards have come out of video arcade games. Look for a board which has 28 pin sockets that are "bussed". This allows a more acceptable method of connecting the 32K SRAM.

The 32K SRAM chips are CMOS devices and are static sensitive. Use a grounded soldering iron and ground yourself by touching a large metal object before handling the ICs.

The pins on the three decoding chips were straightened to allow the chips to be glued to the top of the Z80. From here the required signals were easily tapped. Pins 10, 12 and 13 of the ULA chip are bent away from the socket. This allows a connection for NOT M1 to pin 10 and removes the ULA from any memory selecting. The CSROM signal from the new decoder is applied to the far end of R28. This allows external devices like Printer Drivers to deselect the ROM. On the TS board, resistor R28 is located beside the ULA chip while on the ZX board, it is located below.

The internal RAM could have been decoded as part of this circuit, but I decided to just replace it with a 28 pin socket. On the ZX board, check the right side of the RAM socket to make sure that a jumper is connected to L2 and not to L1. This switchs the signal from +5V to A10.

The two 32K SRAM chips are mounted on top of each other. All of the pins from one chip are soldered to the corresponding pins on the other chip except for pins 20 and 27 which are CS and WE. All of the pins fit into the RAM socket except for pin 28 which is connected to the Battery Back Up circuitry, pins 1, 2, 23 and 25 which are connected to the Address lines taken from the cathode side of the keyboard diodes and pins 20, 22 and 27 which are connected to the control lines from the Decoding Section. The bottom left pin of the 32K SRAM which is pin 14, fits into the bottom right pin of the socket. This lines up all of the signals from the socket to the proper pins on the SRAM.

The Battery Back Up circuitry consists of two Alkaline AA batteries connected in series to produce the required 3V. Make sure that the polarity of the batteries, diodes and capacitor are facing the correct direction.

A surplus TI keyboard was also connected to the system. Some of the unused keys were used as part of this circuit. The "Alpha Lock" key was used for the Write Protect and the "Ctrl" and "Fctn" keys were connected in series to form the RESET switch.

I did not include any automatic Write Protect circuitry in the design since I usually run the system with the memory in the Write Protect mode. This protects the data from accidental crashes. Before shutting down the system, make sure that the Memory Mode switch has been turned to Main Memory to protect the Auxiliary Memory. And make sure that the Write switch has been turned to Write Protect to protect the Main Memory. This prevents the data from being corrupted by the system when it turns on or off.

Troubleshooting Hints

Once the circuit has been completed, you should be able to move RAMTOP up to 64K. However if the ROM has not been selected, the screen will just flash when the ZX/TS is powered up. If the RAM has not been selected, the screen will be blank without the inverse K cursor appearing. And if the chips are incorrectly selected, the system will crash. Recheck the wiring to the decoders and to the memory chips and examine the control lines.

Turn off the Write Protect switch and use the commands;

ZX81 ZX81 ZX81

Hardware

```
POKE 16388,255
POKE 16389,255
NEW
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to raise RAMTOP to 64K. Now use the commands, PRINT INT ((PEEK 16388+256*PEEK 16389+1)/1024), and the value 64 should appear. Press the RESET switch and then switch in the Auxiliary Memory. Leave the WRITE Protect switch in the off position. Again you should be able to move RAMTOP up to 64K. If the returned values are less than 64, the difference indicates where the error has occured in the decoding. Recheck the Address line connections.

Next time we'll start from the beginning to design your own decoding schemes and find some uses for the available gates.

References

Hunter Board
by Paul Hunter
Radio Electronics, Jul 83
Radio Electronics, Aug 83

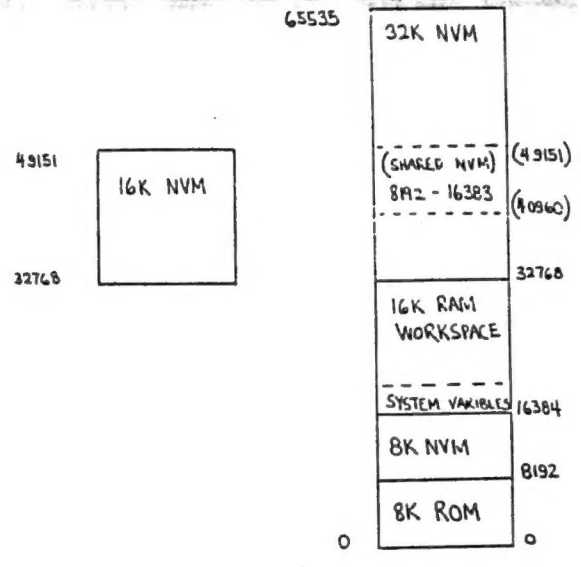
Internal 64K RAM for the TS/ZX
by Tim Stoddard
Time Designs Vol. 3#4, May/Jun 87

Run TS1000 Machine Code in High Memory
by John Oliger
SyncWare News Vol. 2#5, May/Jun 85

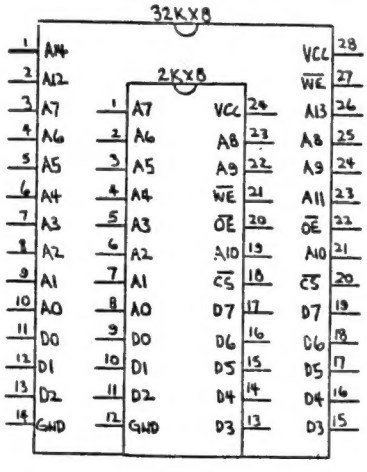
Built-In NVM
by Gerd Breunung
ZX-Appeal, Jul/Aug 86
SyncWare News Vol. 4#1, Sep/Oct 86

Other points of interests:

24K NVM, ZX-Appeal, Apr 88
32K NVM Delta Device, ZX-Appeal, Dec 87
ZX-Appeal, Sum 88



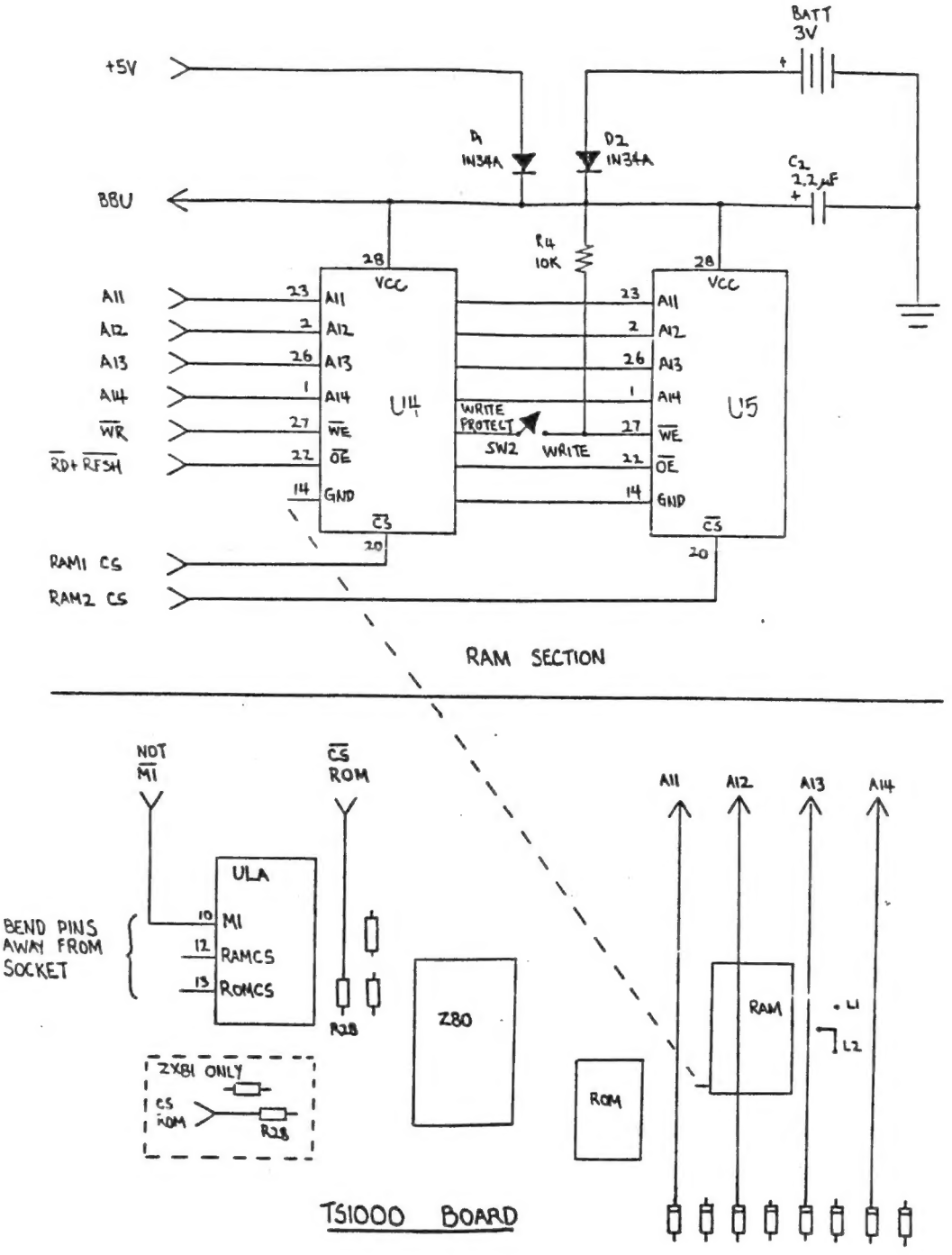
ZX/TS TRUE 64K NVM MEMORY MAP

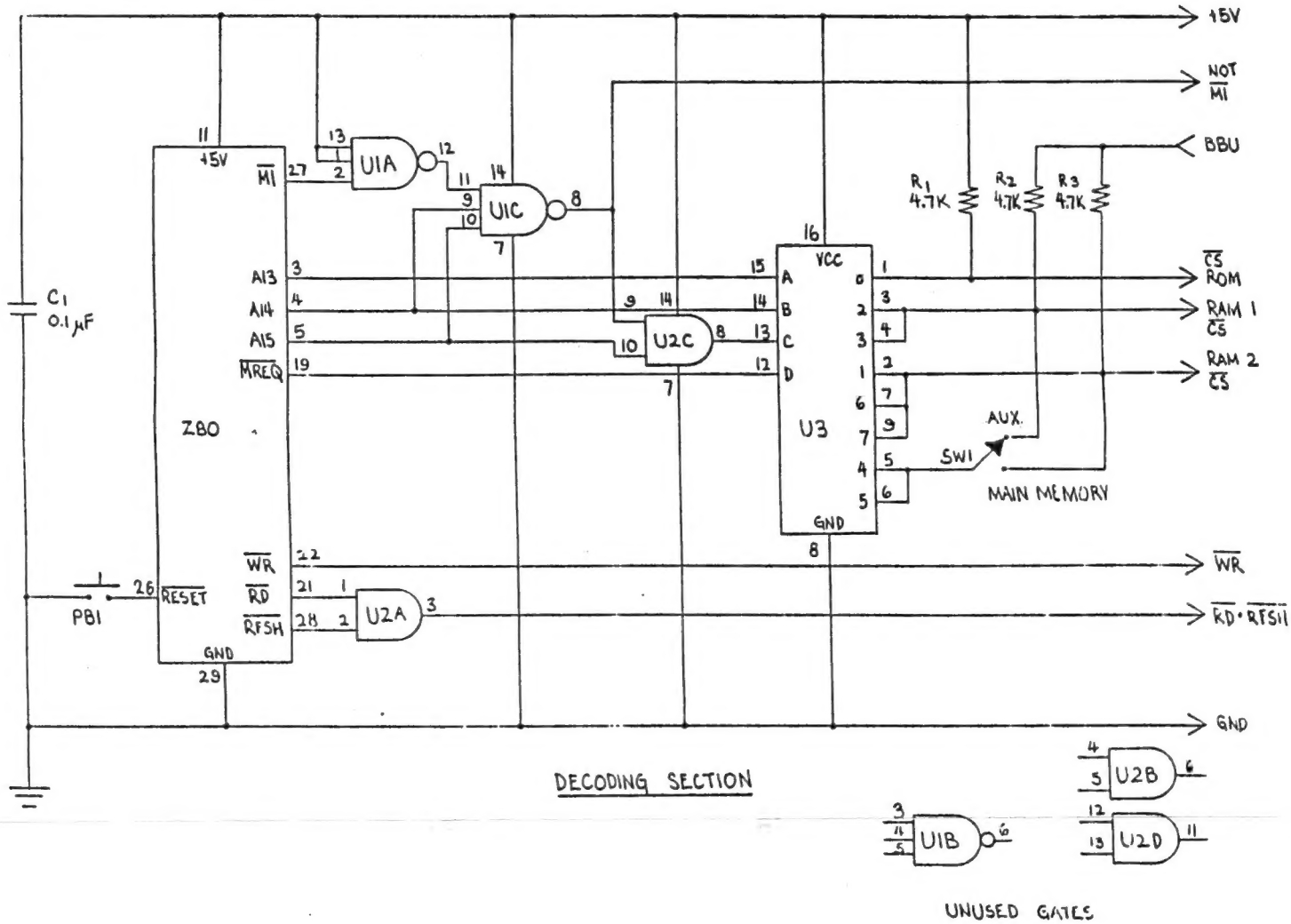


COMPARISON OF THE TS 2KX8 STATIC RAM WITH THE UPGRADE 32KX8 STATIC RAM

ZX81 ZX81 ZX81

Hardware





OIL THAT EDGE CONNECTON

BY FRED STERN

An interesting tip comes from Donald Lambert at ISTUG. Clean the gold fingers of the edge connector on the ZX-81 with a pencil ereaser, then give it a light coat of MINERAL OIL. Installing and removing peripherals from the ZX-81 soon removes the gold plating, exposing the copper under-plating. This copper under-plating will oxidize causing poor electrical contact, and program crashing. The oil creats a barrier which retards this oxidation. The spring contacts on the female mating connecter go through the oil to make a solid electrical contact. This fix should also work on the rear edge connector of the TS-2068, and Spectrum. I have tried it on my TS1000, successfully.

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